

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s):	Litwinski et al.		
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Art Unit:	3677		
Examiner:	F. Saether		
Title:	RIVETS HAVING HIGH STRENGTH AND FORMABILITY		

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**SUPPLEMENT TO APPEAL BRIEF UNDER 37 CFR § 41.37 AND
RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF**

This paper supplements the Appeal Brief filed August 11, 2006 in the application referenced above. Further, this paper responds to the Notification of Non-Compliant Appeal Brief, dated October 24, 2006.

The Notification of Non-Compliant Appeal Brief states that the Appeal Brief is defective for the following reason:

(a) The brief does not contain a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, referring to the specification by page and line number, and to the drawing, if any, by reference characters; and/or (b) the brief fails to: (1) identify, for each independent claim involved in the appeal and for each dependent claim argued separately, every means plus function and step plus function under 35 U.S.C. 112, sixth paragraph, and/or (2) set forth the structure, material or acts described in the specification as corresponding to each claimed function with reference to the specification by page and line number, and to the drawing, if any, by reference characters (37 CFR 41.37(c)(1)(v)).

Accordingly, Applicant is submitting this paper, including the following summary of the claimed subject matter, as a supplement to the Appeal Brief, as set forth in MPEP section 1205.03.

Summary of Claimed Subject Matter

The following summary includes a general description of the invention described in the specification of the present application, followed by a more specific correlation of the claims to the specification.

The present application is directed to the manufacture of rivets having high strength and formability. In this regard, the application describes a forming method as well as the resulting rivets that are formed by the method. *See* the present application, Abstract. As illustrated in the application, each rivet can have a shank with a head at one end. An end of the shank that is opposite the head can be upset to form a second head. For example, Figure 1 illustrates a structural assembly 1 that includes first and second structural members 2, 3 that are joined by rivets 4. *See* the present application, page 6, lines 9-16. The shank 10 of each rivet 4 extends through corresponding apertures 5 of the structural members 2, 3, with the heads 11, 12 of the rivet 4 disposed on opposite sides of the structural members 2, 3. *See* the present application, page 7, lines 4-13

The rivets 4 are formed of a metal or metal alloy with a refined grain structure. *See* the present application, page 7, lines 17-24. In this regard, the application describes a process of refining a grain structure of a workpiece 20 using a non-consumable rotating friction stir welding probe 19 that is moved through the workpiece 20 to mix or stir the material of the workpiece and thereby refine the grain structure. *See* the present application, page 7, line 32 – page 8, line 24. A region 22 of the workpiece 20 having refined grain structure is then removed from the workpiece 20 and used as a blank 23 that can be stamped, punched, extruded, or milled for forming the rivet 4. *See* the present application, page 8, line 33 – page 9, line 8.

As described in the present application, the rivets 4 can comprise aluminum, an aluminum alloy, titanium, or a titanium alloy. For example, the rivets can be formed of

aluminum alloys such as AA 2017-T4 aluminum alloy or AA 2017-T4 aluminum alloy. *See* the present application, page 3, lines 26-30.

The rivets 4 of the present invention preferably have a refined grain structure with a grain size of less than about .0002 inches (approximately 5 microns). More preferably, the rivets 4 "consist essentially of, according to one embodiment, or substantially comprise according to another embodiment, a refined grain structure with a grain size ranging in order of magnitude from approximately .0001 to approximately .0002 inches (approximately 3 to 5 microns) and having equiaxed shape." *See* the present application, page 7, lines 17-24. Some such refined grain structures are illustrated in the application. For example, Figures 11 and 12 illustrate at 100 times and 500 times magnification, respectively, the refined grain structure of rivets 4 formed from AA 2195-T6 aluminum alloy. *See* the present application, page 9, lines 9-11. The grain structure of the rivets 4 is distinguished from the grain structure of conventional rivets formed of AA 2017-T4 aluminum alloy, illustrated in Figures 9 and 10 at 100 times and 500 times magnification, respectively. *See* the present application, page 9, lines 11-13.

As described in the present application, the rivets 4 formed according to the present invention advantageously have a refined grain structure that resists the formation and propagation of cracks and, thus, have improved formability so as to resist necking, cracking, or tearing during manufacture and installation. *See* the present application, page 9, lines 14-17. It is believed that the refined grain structure or fine-grain material from which the rivets 4 are formed according to the present invention is more formable than the unrefined grain structure or course grained material used to form conventional rivets, since the former has a greater total grain boundary area to impede dislocation motion. *See* the present application, page 9, lines 17-21. This is contrary to the conventional relationship between grain size and formability that results from cold working, *i.e.*, cold working increases strength and refines grain size, but decreases formability. *See* the present application, page 9, lines 21-24.

A single independent claim is involved in the appeal, namely, Claim 38. Claim 38 is directed to a rivet comprising "a shank having a head at one end thereof," "wherein the shank and the head consist essentially of a grain structure having a grain size between about 3 microns and 5 microns." The subject matter of Claim 38 is concisely described above with reference to

the specification by page and line number and to the drawings. In particular, as noted above, the present application describes at page 7, lines 4-13 a rivet **4** that comprises a shank **10** having two heads **11, 12** at ends thereof. The rivet **4** is shown in Figure 1. As also noted above, the present application describes at page 7, lines 17-24 that the rivet **4** can consist essentially of a grain structure with a grain size between about 3 microns and 5 microns. Refined grain structures are illustrated in Figures 11 and 12 of the application.

The dependent claims add further limitations regarding the material of the shank and head. Therefore, although 37 CFR 41.37(c)(1)(v) does not require a concise explanation of the subject matter defined in each of the dependent claims involved in the appeal, Applicant nevertheless provides such a description below. In particular, Claim 39 recites that the shank and head "comprise a material selected from the group consisting of aluminum, an aluminum alloy, titanium, and a titanium alloy." For example, as described in the application, in one embodiment, the shank and head comprise aluminum, an aluminum alloy, titanium, or a titanium alloy. See page 3, lines 18-19. Figures 9-12 illustrate the grain structure of rivets formed of two particular aluminum alloys.

Claim 41 recites that the shank and head "comprise a refined grain structure formed by stirring with a friction stir welding probe." This feature is described the present application, e.g., in reference to Figure 6, which illustrates that the refined grain structure is formed by mixing or stirring a portion of a workpiece **20** with a non-consumable rotating friction stir welding probe **19**. See page 7, lines 24 – page 8, line 24.

Claims 43-46 recite that the shank and head comprise or consist essentially of more particular aluminum alloys. For example, Claim 43 recites that the shank and head "comprise AA 2195-T6 aluminum alloy." Figures 11 and 12 illustrate the refined grain structure of a rivet formed of this aluminum alloy. See page 9, lines 9-11. Claims 44-46 recite that the shank and head "consist essentially of a series 2000 aluminum alloy" (Claim 44); "consist essentially of AA 2195-T6 aluminum alloy" (Claim 45); and "consist essentially of AA 2017-T4 aluminum alloy" (Claim 46). For example, the present application states that the rivets **4** of the present invention can consist essentially of a refined grain structure and illustrates rivets consisting essentially of a series 2000 aluminum alloy (see Figures 9-12, illustrating two particular series

2000 aluminum alloys); AA 2195-T6 aluminum alloy (*see* Figures 11 and 12); and AA 2017-T4 aluminum alloy" (*see* Figures 9 and 10, and page 9, lines 11-17).

The claims involved in the appeal do not include any means plus function or step plus function under 35 U.S.C. 112, sixth paragraph.

CONCLUSION

Applicant respectfully requests consideration of the above summary. Further, for the reasons set forth in the Appeal, Applicant submits that the rejections of Claims 38-46 are erroneous and therefore requests reversal of the rejections.

Respectfully submitted,



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